Charge Gas Compressor Fourth Stage Vibration

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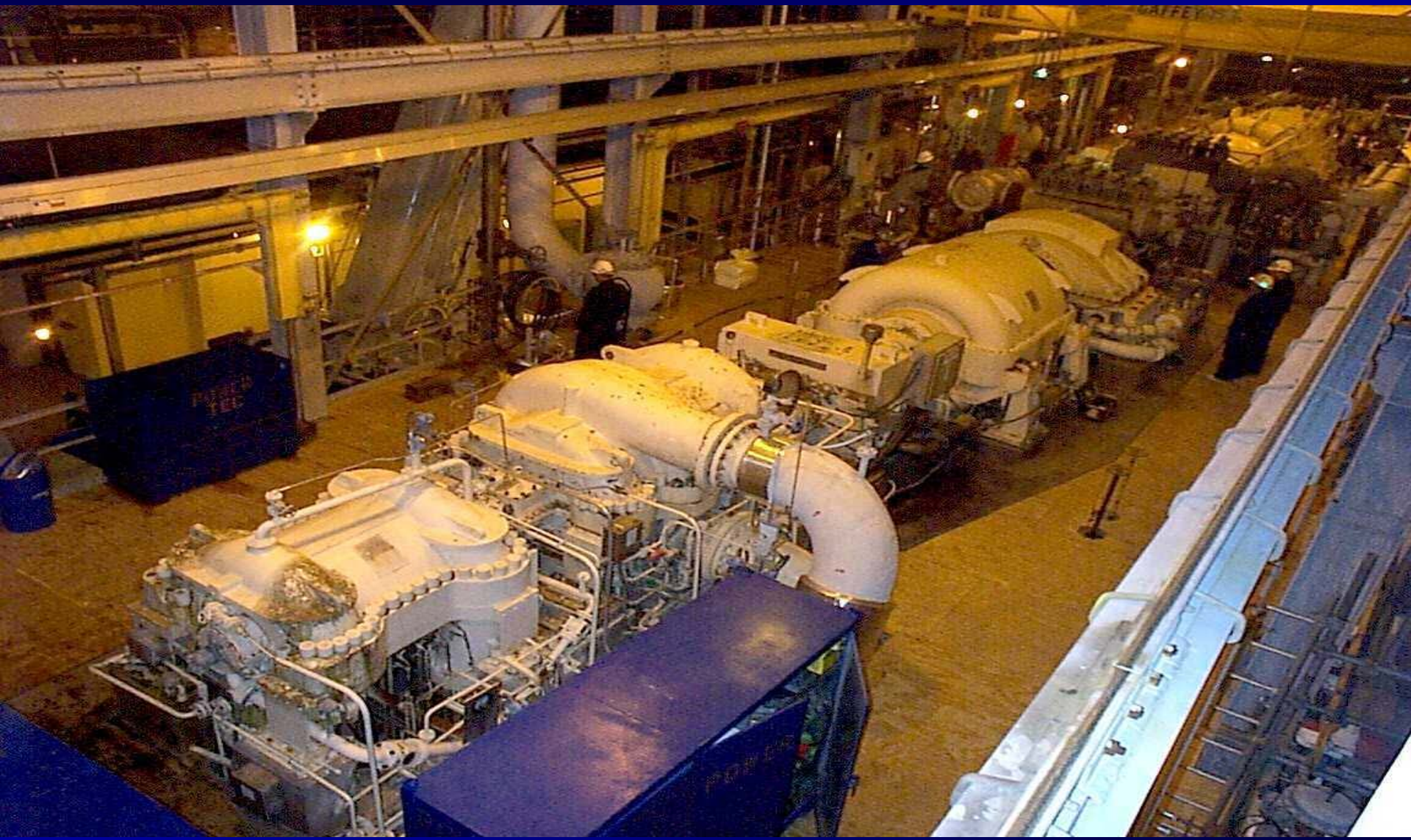
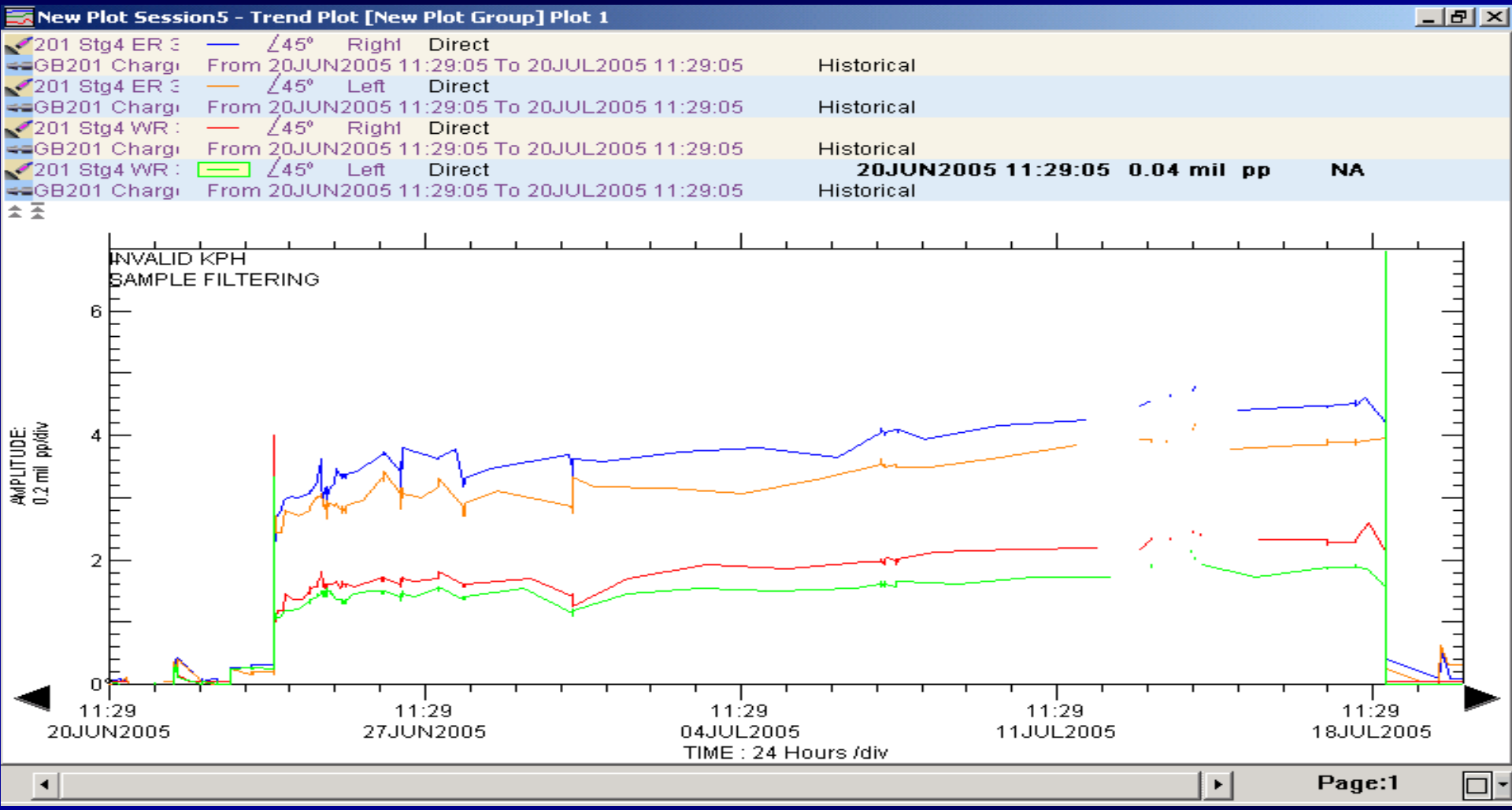
Problem

- Radial Vibration Spiked to 4 mils Upon Start-up from 2/3 Stage Outage
- Internal Fouling was the Suspected Cause

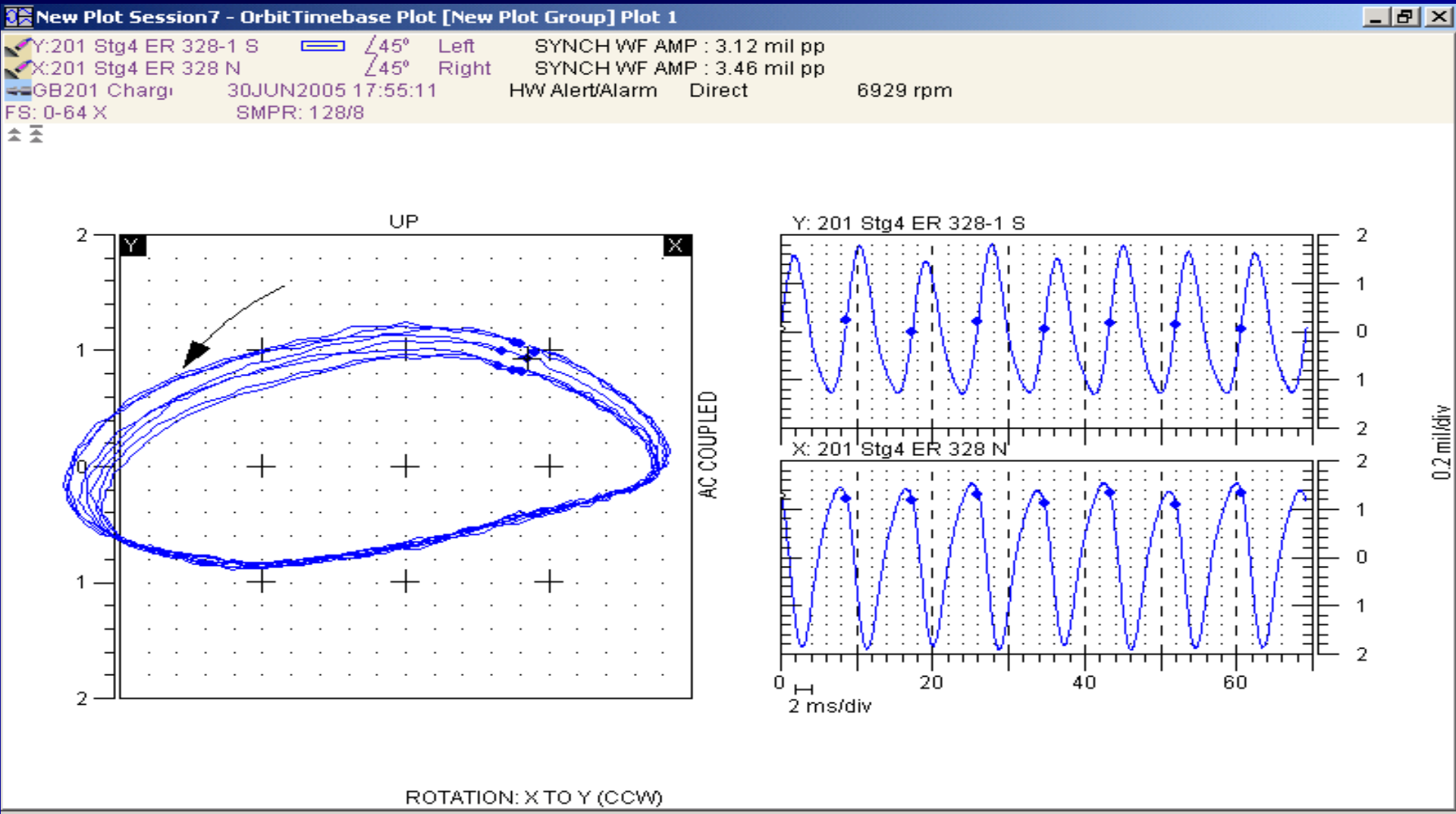
GB201 Compressor Train



4th Stage Vibration Trend



4th Stage Orbit



Wash Oil Flush

- Attempted to Remove Suspected Fouling by High Volume Oil Flush
- 8000 Gallons Used
- No Effect on Vibration

Shutdown/Overhaul

- Opened Case and Found Indications of a Watermark on Rotor and Diaphragms
- Close Examination Showed Top Layer of Antifoulant Coating was Missing

As-Found Rotor Balance Check

Balance Procedure:
Full Assembly Bal. ☐ Check Bal. ☐ Individual Bal. ☐ Progressive Bal. ☐

Type of Rotor:
Turbine ☐ Compressor ☒ Other 38M6-5 Rotor
Wheel/Disk Number _____ Shaft only ☐

Balance Machine Used: 5,000 lb. IRD Balance Speed 700 RPM
Balance Tolerance: .77 TOTAL (oz-in/gr-in) per API Specifications
Rotor Weight: 1409 lbs Operating Speed 7287 RPM
Correction Radius: 6 Inch(es) Coupling End
6.5 Inch(es) THRUST End

REQUIRED INFORMATION
☐ AS RECEIVED
☐ AFTER REPAIR
☐ NEW
☐ FINAL

Initial Balance Machine Readings:

49.167	oz./(gr.)	at 242	Degrees on	Coupling	End	10.405	(oz-in)/gr-in
91.481	oz./(gr.)	at 241	Degrees on	THRUST	End	20.974	(oz-in)/gr-in

Static Corrections:

Initial _____	oz./gr.	at _____	Degrees on	_____	End	_____	oz-in/gr-in
Final _____	oz./gr.	at _____	Degrees on	_____	End	_____	oz-in/gr-in

As-Found Rotor Balance Check

Left Radius	Distance a	Distance b	Distance c	Right Radius
6.000 inch	15.750 inch	42.500 inch	61.250 inch	6.500 inch

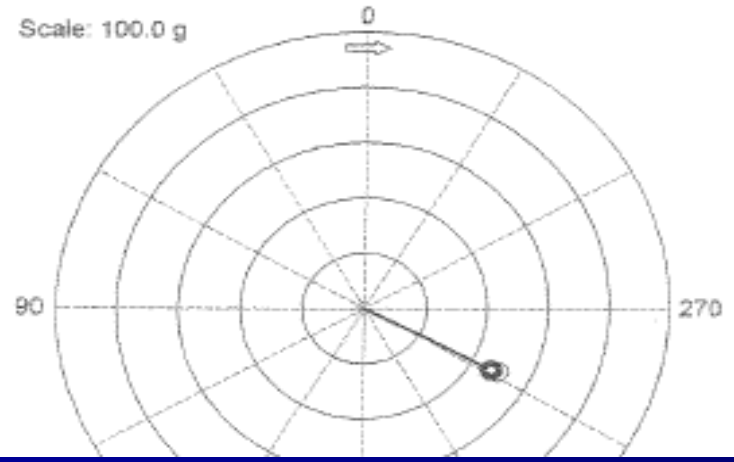
Balancing speed		Left Tolerance	Right Tolerance	
705 RPM		14.770 g-inch	15.791 g-inch	

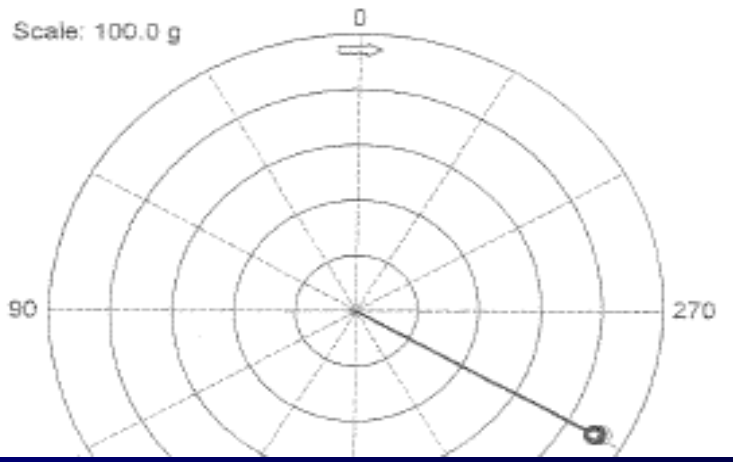
INITIAL RESULT:

	Left	Right
Correction Weight:	- 49.167 g at 242°	- 91.481 g at 241°
Unbalance:	295.005 g-inch	594.629 g-inch
	Reject (19.97 x Tol)	Reject (37.66 x Tol)

CURRENT RESULT:

	Left	Right
Correction Weight:	- 47.117 g at 242°	- 89.982 g at 240°
Unbalance:	282.702 g-inch	584.883 g-inch
	Reject (19.14 x Tol)	Reject (37.04 x Tol)



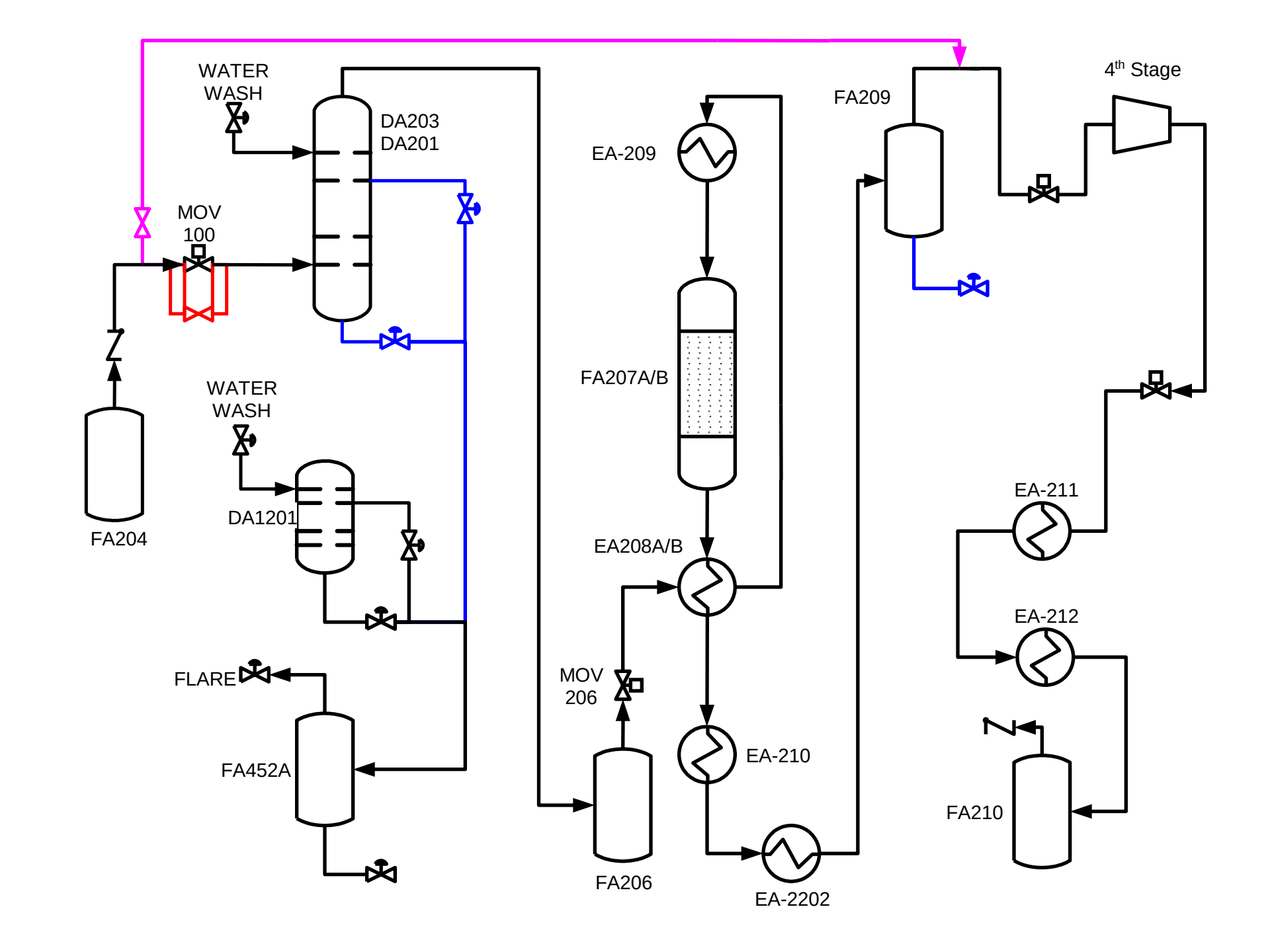


Balance Check of Rotor

- 585 Gram-inches Unbalance on Suction End of Rotor
- 283 Gram-inches Unbalance on Discharge End of Rotor
- Phase Angle Essentially Identical
- 2560 Pounds of Force at 7000 rpm (Rotor Weighs 1409 Pounds)

What Caused the Coating Loss?

- Misvalving Caustic Wash System Backed Caustic Water into Fourth Stage Compressor Case
- Case Drains Plugged


WATER
WASH
DA203
DA201
MOV
100
FA204
WATER
WASH
DA1201
FLARE
FA452A
EA-209
FA207A/B
EA208A/B
MOV
206
FA206
EA-210
EA-2202
FA209
4th Stage
EA-211
EA-212
FA210

Summary

- High Vibration Due to Rotor Unbalance from Loss of Antifoulant Coating
- Coating Loss due to Caustic Water Filling Casing While Charge Gas Compressor Train Down for 2/3 Stage Overhaul
- Procedures and Check-sheet have been Revised to Prevent Recurrence